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A STUDY OF *SPHEX BREVICEPS* (SMITH) (HYMENOP.)

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The digger wasp, *S. breviceps**, has been encountered frequently in the field while studying nesting bees and wasps. *Ammophila pruinosa* Cress., *A. varipes* Cress., and *A. comanche* Cam., according to Professor Fernald**, must be considered as synonyms. It is a species of considerable morphological variation with all intergrades occurring between the extremes. It is not a large insect but it makes up in numbers, it would seem, for what it lacks in individual size.

The wasp begins nesting by searching for a suitable location on the ground at which to start excavating. This is done by flying from place to place, walking along on the surface, circling about and ever and again testing the location and soil with antennae and jaws. The time spent at this activity varies according to field conditions and individuals participating in it and usually includes a few rejected attempts at nest digging before one is completed.

The unfinished tunnel, when abandoned for all time, is usually hastily filled in with pebbles, loose soil, or other available debris at hand. It may sometimes be left but half-filled, or again entirely empty. Females have been observed, engaged in the work at and near Los Angeles, California, early in June and as late as the latter part of November. One found on Thanksgiving day in 1927 affords an example of certain habits of the species.

This female was found along the Los Angeles River at Griffith Park. The day was bright, clear, and fairly warm, and thus quite suitable for nest digging and provisioning. When first met with, the wasp had barely started the nest tunnel. She was watched at her work until caught; at this time the nest was complete and the first prey captured. At first she deposited loose soil, freed with her jaws, near and to one side of the source. Later, as the tunnel was being formed, she backed out with a load of sand, flew or half-jumped with it to a distance of 1½ inches away where it was released. She would then walk back, with an occasional flip of her wings, to secure another load. Sometimes, after releasing the sand, she would brush the dust from her head and body with her fore legs.

As a rule, *S. breviceps* flies with the sand or soil from the tunnel and returns to it in like manner for another. The exception noted in this instance may have been due to the unusually short distance she was carrying the material, due in turn possibly to the large amount of debris, such as grass, dead leaves and the like, surrounding the nest site. The sand, at this spot, was extremely fine which added to the difficulty of carrying it away and may have modified the wasp's usual activity. She held and transported the sand and soil with her jaws, assisted by her fore legs, in a manner similar to that followed by *Podalonia*

*Kindly determined by Professor H. T. Fernald.

**Fernald, H. T. "Notes on Some American Sphecinae." Ann. Ent. Soc. Amer. Vol. 24, pp. 448, 449.

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violaceipennis form *luctuosa* (Sm.) and others.

After a period of 10 minutes spent in excavating, the wasp sought a pellet or small object to temporarily close the entrance to the tunnel. The open area about the nest consisted of such fine sand, with so little coarse material in it, that the task of finding an object suitable for a plug was somewhat difficult. She scoured the territory many times within a radius of 2 feet in the search. Sometimes she took hold of small sticks or sand clods but finding them unsuitable, released them. After a period of failures she walked about more rapidly, or appeared to search frantically for a time, then became slower and more deliberate in action.

She finally found, after 10 minutes and 23 seconds of active searching a rather large but suitable sand plug secured at a distance of 2 feet and 7 inches away. This she grasped with her mandibles, carrying it with them almost entirely as she walked to the tunnel. There she placed it in the orifice. It fitted to a nicety and served as a sole barricade to the nest while she was later away in the search of prey.

A parasitic fly, with field habits similar to *Hilarella hilarella* (Zett.), was about the nest while *S. breviceps* was digging and later while she was searching for a plug. But this wasp did not become nervous in the face of this intrusion as has been observed in the case of *P. violaceipennis*. *S. breviceps* occasionally walked towards it and drove it away but did not show an increase in rate of movement or activity because of it.

The nest completed and ready for provisioning, the digger brushed her body very carefully and quite completely. This continued, at brief intervals between short flights, until she arrived at some plants at a distance. These she began to search, starting each time near the base and working upwards, for a larva for prey.

The coveted prize had not been captured 6 minutes later. She was searching 9 feet away from her nest on the common ragweed, *Ambrosia psilostachya* D.C. She was going over the branches and leaves of a rather old plant very slowly and carefully. So very intent was she upon her work, as she methodically inspected the plant, she was not disturbed in the least by my presence.

Two minutes later, during a time I had chanced to look away for a moment, the wasp found her prey. She had grasped the long, dark, slender "measuring-worm" with her jaws while holding onto the stem with her legs. The larva was holding onto a stem also, but with its anal legs, which continued to grasp the support during the period the wasp was stinging it.

The first observed sting was directed to one of the fore abdominal segments and was continued three times more, in segments progressively posterior. Later, the wasp stung it again in the position of the second of the first four stings and still later, once more in apparently the same segment. The larva, even after the observed six stings, was yet able to cling to the plant stem with its anal legs.

The wasp next dropped to the ground still holding onto the prey. The force of her weight and fall caused it to be pulled loose and brought also to the ground. After brushing her body for a few seconds, the wasp grasped the prey and carried it in the typical position, head to head and belly to belly, to the nest.

The distance traversed was covered on foot, interspersed by short flights, in an almost direct line. Arriving at the nest, she released the prey with its head near to the closed tunnel. She then removed the plug with her mandibles, grasped the larva with them, backed in with it and out of sight. She was caught a little later on coming out and held for identification. Further data were not secured therefore from this individual but many others have been studied and furnish additional facts.

Several times instances have been met with of the wasp stinging her prey. The prey often consists of very small larvae and the physical difficulties of stinging them are great. It is a somewhat ludicrous sight to find a female beneath the willows endeavouring to extend the tip of her abdomen between her legs and beneath her body, or about it, to sting a larva almost too small to hold and manipulate with her jaws. One wasp was found to become very excited because of her difficulties and failures, twisting the prey about in her jaws and biting it to its almost immediate destruction.

A female nesting July 28th at Long Beach, California, offers some interesting variations in habit while verifying, as others have done, certain major purposes. This wasp spent 45 minutes of constant work, with the exception of one brief rest of 12 seconds, in the removal of 161 loads of soil and in the completion of the nest digging. While loosening the soil with her jaws she often produced the sound, characteristic of certain wasps when excavating and accomplished by a rapid buzzing of the wings or movement of the abdomen (?) which was sometimes repeated on releasing the material at a distance from the nest.

The plug or pebble, serving as an outer barricade to the nest or tunnel, was again secured only after some difficulty. This in general applies particularly to the first plug secured; later, when it is removed between visits to the nest the pebble or pebbles constituting it are ready at hand and are often used again.

The evidence does not show that this wasp is always able to leave the tunnel and unerringly select a pebble of the required size to fit it. She does seem to have a conception of the size of the object needed, however, but obtains it only after overcoming certain difficulties. A review of the activities of this wasp in securing and placing a plug are given below.

During a 9 minute search for an object to close the tunnel, the wasp returned to the nest 8 times. She walked about it and back, making flights carrying her from 2 inches and by series to as far as 3½ feet away from the nest. Her searching was partly on foot, partly on the wing. Sometimes she flew directly to the nest in one flight; or again, she reached it after a circling about. While seeking a hard object of the right size to fit the upper, free end of the tunnel, this wasp grasped and moved about apparently testing pebbles, small hard pieces of soil, broken and dried parts of stems and leaves; in fact, all objects of the approximate size found on the ground about the tunnel.

A number of times on her return to the nest, the wasp entered the tunnel, descended the shaft and removed a load of loose soil. It was probably material which had fallen within as she walked above on the surface.

The only objects actually carried to the tunnel were pebbles. She started to the nest twice with a pebble too large and heavy for use, which was dropped

on the way and another search begun. The first pebble taken the entire distance to the tunnel was too large and upon its failure to fit readily into the opening, it was carried away. The second was too small and met the fate of the first. It was interesting to see how quickly she carried this smaller one away when it failed to meet her needs.

The third pebble fitted almost perfectly. It was quite heavy and in carrying it the wasp, although she started out boldly to fly with it, reached her destination only after a series of short flights, resembling hops. Placed in the tunnel, she hastily kicked backward with her fore feet sufficient loose soil to cover it well, circled about a few times and was away. She did not pound the soil over the entrance with a tool; in fact, she did not pack it at all.

The nest was marked and six days later its nature and content noted. The diameter of the tunnel measured 4 mm., the upper 3.5 mm. of which was filled with a plug even with the surface. The exact location was so well concealed that had it not been previously carefully marked by a circle of pins and by other means it might not have been found again. Below the plug the tunnel continued nearly straight for 25 mm. where it enlarged into a cavity or cell. This cell contained a wasp larva which had its food already consumed and which was about ready to form its cocoon. The cell in which it was found measured 18 mm. in length, 10 mm. in width and 8 mm. in depth.

Placed in a test tube with a cotton stopper and kept in a warm room, the larva began forming its cocoon the evening of the same day the nest was secured. A day later the cocoon was well formed, although not completely finished for the insect could be seen working within. The next morning the cocoon was dark and thick and other facts could not be noted.

This same species, although another individual, was seen to come to a nest which had already been partially or completely excavated. She had suddenly alighted, from a flight in the air, in the center of a smooth area free from plants and other objects of size. Seemingly much at home she walked a few millimeters, removed some loose soil, grasped a large cinder which fitted well into the opening, and revealed the nest which was not before visibly in existence.

Her purpose seemed merely to remove some soil, which she did in a very orthodox fashion. Her work was rapid but not hurried. When she had finished, she grasped the cinder used before, placed it so it fitted exactly the opening, then flew away. In this instance she did not even conceal its location with a covering of loosened soil.

While she had been working a very beautiful Chrysid, later caught, and identified by Dr. Leland H. Taylor as *Chrysis (Holochrysis) pacifica* Say*, came and remained near at hand. Although it sometimes drew back, when the wasp came quite close to it, there was no outward evidence of fear on its part. The wasp, in turn, gave it little if any attention but continued with her work. After the digger wasp had gone away, the cuckoo wasp worked her way between the cinder and the soil walls of the tunnel and went below. It walked into a vial trap a few seconds later, upon leaving. The active interest this parasite took in the nest of the wasp doubtless bode no good to the provisioner. The nest, however, at this time, had not been provisioned.

*Determined as this species or an unnamed variety very close to it.

Another nest, also observed at Long Beach, showed a rather careless attitude and attention to the entrance barrier of the tunnel. The wasp was first seen flying with a small larva in her jaws. She alighted near a nest, released her prey and proceeded to remove the plug. She started to back into the tunnel but as if on "second thought," turned about and entered head first. The purpose apparently was to inspect the nest and to remove some loose material which had fallen inside. This accomplished, she backed within, grasped the fore part of the larva and pulled it slowly out of sight.

Upon coming out again after a few seconds, she hastily fitted the plug in place and without further ado flew away to the fields. Parasites or other enemies could easily have gotten into the nest for the plug did not fit tightly, there being small openings about the edges and no loose soil placed above to protect or conceal the spot.

She returned in ten minutes, then after nine minutes and again, after a much longer time to repeat the main sequence noted above. The insect was then taken for identfication. She had been working very rapidly and securing prey faster than any before observed. The weather was hot, the time about noon and general field conditions excellent.

The tunnel of this nest extended nearly straight into the earth for more than two inches, then enlarged into a cell which contained a young wasp larva and five other larvae, constituting a part or the whole of necessary provisions. These latter larvae were green and of a kind not before met with in this locality. In fact, there remains some doubt even if they were lepidopterous larvae. They may have been fly larvae, the young of some Syrphid, which the wasp had found on a plant in the vicinity. That the wasp would ever vary so much in habit in prey selection seems very unusual but that she did in this instance appears probable.

In an attempt to secure the prey alive and in normal condition to rear to maturity, much time was spent beating the plants for many feet about the wasp's nest. Not one was found. It may have been that the wasp was carrying them from a much greater distance.

The waspling from this nest was feeding from the ventral side of one of the prey and although it was jarred about in the vial on taking it home, it still held on and resumed or continued its feeding upon arrival. It was much lighter in color than the prey and could readily be distinguished from them in general shape, being decidedly more elongate. At this time, the prey responded readily to mechanical stimuli. The wasp larva ate them to the last and later spun its cocoon in the vial.

While this wasp habitually stores its cell with several small moth larvae, often apparently including many species, it regularly lays but one egg in a given nest and that on the side of the abdomen of the first prey captured. This egg is some 2.5 mm. long, about .5 mm. thick, slightly curved and light in color. In many instances it does not hatch until after the final provisions have been completed.

Certain facts in regard to the cocoon have been noted. In the vial the larva formed an elaborate framework of fibers, attached to the glass and going out to all sides from the outer covering of the cocoon. The firmness with which these held to the glass spoke for their former viscosity. The outer covering was

considerably larger, thinner and less dense than the compact cocoon within, allowing the outlines of the latter to be readily seen through its walls. It measured in this instance, 15 mm. in length by 7 mm. in width near the anterior end, the structure being in general, club-shaped. Like the fibers about it, this covering was reddish-brown but had been much lighter and more fluid at first and in time became darkened and hardened.

TWO NEW SPECIES OF PHLOEOSINUS CHAPUIS (SCOLYTIDAE-COLEOPTERA)

BY C. R. BRUCK,
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Phloeosinus setosus n. sp.

A small robust species, length 1.5-2.5 mm.

Front of the male deeply concave, clothed with short bristle-like hairs, sparsely granulate-punctate, surface opaque, with a long, shining, median carina; second suture of the antennal club subtransverse. Pronotum wider than long, 5.5:3.5; sides slightly rounded, narrowing on the anterior half, constricted behind the anterior margin; the constriction extends across the dorsum, widening on the disk thereby simulating a wide, deep impression on the anterior third; anterior margin is broadly rounded; the surface is moderately clothed with short setae and the punctures are large, dense, and deep. Elytral striae one-half as wide as the interspaces, distinctly impressed but not as deep as wide, punctures are small and deep and separated by many times their diameter; interspaces are convex, sparsely confusedly rugose-punctate and largely, deeply punctate on the disk; lateral interspaces confusedly rugose-punctate near the base, the remainder of the interspace is sparsely, definitely rugose-punctate with rugosities in a definite row and widely spaced, punctures are very large with a stiff, coarse, long seta arising from each puncture; the first and third declivital interspaces definitely elevated, the first is densely clothed with short scale-like hairs and long setae, and like the third and fifth, which have no scale-like hairs, it is definitely but sparsely serrate; serrations are much shorter than the setae, second and fourth interspaces are smooth, shining, and naked, the remainder of the interspaces are rugose. The mesasterum is precipitous.

The female differs from the male in that it has the front faintly impressed on the epistomal area and the carina is very short and indistinct. The rugosities of the elytral disk are less confused except near the base, while on the lateral interspaces they are more granular in appearance, less distinct, and more widely spaced; the declivital serrations are smaller and less acute.

This species is closely related to *P. (minutus) swainei* Bruck but is readily separated by the large erect setae and the larger punctures on the elytra; the second and fourth declivital interspaces are naked, smooth, and shining, and the first is densely clothed with scale-like hairs and setae, the third, fifth, and remainder are only clothed with setae. In *P. swainei* Bruck the elytra, including all of the declivital interspaces, is sparsely clothed with short scale-like hairs; granules extend well onto the summit of the second and fifth declivital interspaces and the faces of these interspaces are finely rugose; the first and third declivital interspaces are hardly elevated whereas in *P. setosus* they are distinctly elevated and the serrations are larger.

Long series of this species were collected by Dr. E. C. Van Dyke, Mr. E. F. Wohletz, and myself on the small branches and twigs of a recently felled Sargent cypress tree, at Mt. St. Helena, Calif. on March 29, 1931.

The holotype and allotype are retained in the author's collection, one pair of paratypes will be placed in the collection of Dr. Van Dyke, deposited in the California Academy of Sciences, San Francisco, one pair will be sent to Dr. Swaine for the Canadian National Collection, and a number of designated paratypes will remain in my own collection.

Phloeosinus frontalis n. sp.

Front of the male very deeply concave; concavity glabrous, with a short median carina arising from the epistoma, moderately fringed with short scale-like hairs. First suture of the antennal club subtransverse, second slightly oblique, third very strongly oblique. Pronotum wider than long, 3:4.5, deeply densely punctate, sparsely clothed with scale-like hairs, sides strongly arcuate, strongly sinuate anteriorly. Elytra slightly longer than wide, 5.0:6.0, striae narrow and deeply impressed, strial punctures small, deep, and widely spaced; interstriae moderately rugose on the disk, scarcely rugose on the sides, densely moderately punctate, sparsely clothed with scale-like hairs. First, third, and fifth declivital interspaces, strongly, acutely serrate, seventh with only two serrations and the ninth with only one; the serrations are long, acute, and widely separated; all of the declivital interspaces are densely clothed with scale-like hairs. Body densely clothed with scale-like hairs. Length 1.5-2.5 mm.

The front of the female is very densely clothed with short scale-like hairs, impressed behind the epistomal region, sub-glabrous, very faintly punctate, with a well developed longitudinal carina dividing the impression, the remainder of the front densely rugosely punctate. First, third, fifth, seventh, and ninth interspaces with smaller serrations than those in the male but as numerous and as acute.

This species closely resembles *P. (minutus) swainei* Bruck and *P. setosus* but is readily separated from both species by the elytral interspaces being much wider than the striae whereas in *P. swainei* Bruck and *P. setosus* the striae are almost one-half as wide as the interspaces. The front of *P. frontalis* differs from the front of *P. swainei* and *P. setosus* in that the male has a very deep concavity and the median carina is almost obsolete, the front of the female is distinctly impressed and has a very well developed carina. The male of *P. setosus* has a shallow concavity with a very faint carina, the front of the female is plano-convex with a very short indistinct carina. The front of *P. swainei*, male, is hardly impressed with a carina almost obliterated by the granules, the front of the female is flat with a long fine carina. The declivital serrations of *P. frontalis* are long, acute, very distinctly and widely separated and the first and third interspaces are faintly elevated.

The holotype and allotype will be sent to Dr. H. E. Burke to be deposited in the U. S. National Museum, one pair of paratypes will be placed in the collection of Dr. Van Dyke, deposited in the California Academy of Sciences, a male paratype will be sent to Dr. Swaine for the Canadian National Collection, and the remainder are retained in my collection through the courtesy of Dr. Burke.

Seven males and four females were reared from a branch of Arizona cypress which was collected at Rialto, Calif., on May 2, 1930, by Dr. H. E.

Burke of Palo Alto, Calif. The adults emerged in the summer of 1930.

The Arizona cypress is probably the adopted host for this species as it has never been taken from this cypress in the normal habitat of this tree. Its native host is possibly the Juniper for this is the only cupressine tree native to the San Bernardino territory.

Phloeosinus (minutus) swainei Bruck

In 1894, Mr. Walter F. H. Blandford described in his paper "Rhynchophorous Coleoptera of Japan," a new species of *Phloeosinus*. The description was published on page 71 in the "Transactions of the Entomological Society of London" and it was described as *Phloeosinus minutus*. In 1917 Dr. J. M. Swaine described a North American species of *Phloeosinus*, using the name *P. minutus*. This new species was described in his paper, "Canadian Bark Beetles" Pt. I, published in Dominion of Canada Department of Agriculture, Entomological Branch, Bulletin No. 17." Since the name has been preoccupied by Mr. Blandford at an earlier date and the species described by him is valid today, I designate the species described by Dr. Swaine in 1917 as *Phloeosinus swainei* in commemoration of the extensive work done by Dr. Swaine in the family Scolytidae of North America.

ADDITIONAL NOTES ON TROPAEA LUNA (LEPID)

BY HARRIET A. WICKWIRE AND ADELE CALALE,
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Robert E. Birdsong published some notes on *Tropaea luna* in the November 1932 issue of this magazine, which were of especial interest to us as we have been working along the same lines.

In addition to the variations in ova-coloration which were mentioned in the article, we have obtained ova which ranged in color from sky-blue to apple-green. In one of the few cases in which we obtained pure white ova, they turned green after a few days and never hatched. We have not noticed black micropyles.

We consulted the following works for descriptions: Ballard, Julia P., "Moths and Butterflies," 1902 (Page 128); Eliot and Soule, "Caterpillars and Their Moths," 1902 (Page 258); Porter, Gene Stratton, "Moths of the Limberlost," 1912 (Page 182); Miller, E. R., "Butterfly and Moth Book," 1931 (Page 35); Packard, A. S., "Memoirs of the National Academy of Sciences," Vol. XII, 1914 (Page 193; Plates XV, XVI, XVII).

After reading the above material one gathers that the early stages of *Tropaea luna* show considerable variation. Apparently the brown color is explained by the coating of brown glue which fastens the ova in place, and varies in quantity and quality with the age and condition of the mother moth; however, this fails to explain the white, blue, green, and cream-colored ova and how they are kept in place. Obviously these colors affect the shell pigment itself and cannot be attributed to a coating of glue.

In 1931 we discovered a peculiar thing about the two forms of *Tropaea luna*, described by Mr. Birdsong, and previously described and figured by A. S. Packard. We confined each moth in a paper bag for oviposition, placing the date and the number representing the individual on the bag. Each night's ovipositing was counted and recorded in our notes under the corresponding number of

the moth. The ova of each moth were kept in separate test tubes labeled with this data. Due to this system, we noticed that ova deposited on a given night by a given moth would produce a majority of one of the two forms of hatchlings, and that this majority changed from one form to the other on alternating nights. If 1 ♀ deposited ova on June 1 which produced larvae mostly of the plain green type, the ovipositing of this moth on the night of June 2 would produce a majority of striped larvae, etc.

In 1931 we separated the two forms of hatching larvae and kept them separated through all their stages. When the moths emerged in 1932, they were mated to their own kind. The resulting brood of hatchlings showed that the plain green form bred true. There were no striped larvae among the offspring of a pair of moths whose larvae had been unstriped. This was not true of the striped form, however, as there were a few plain green offspring among the broods whose larvae had been striped.

We hope to carry on the experiment through another generation in 1933 in order to see if it is possible to obtain a pure culture of striped larvae.

Apparently *Tropaea luna* has local food preferences. In our locality (Central New York) shagbark hickory seems to be the favorite and we have had no trouble raising the larvae on it. In 1930 we tried to feed a brood on red oak, and in spite of the fact that oak is given by many authors as food for *Tropaea luna,* these larvae died rather than eat it. Occasionally we have found full grown larvae of this species under butternut trees, but there were many shagbark hickory saplings in the vicinity, so these larvae might have wandered from the shagbark.

THE ODONATA OF MANITOBA

BY E. M. WALKER,
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In 1912 the writer published a preliminary list of the Odonata of the prairie provinces of Canada (Walker, 12a), in which 49 species were recorded, including 40 from Manitoba. Since that time 23 additional species have been taken in this province and our knowledge of the distribution of those already recorded has been considerably extended. Some of these records have already been published in the "Entomological Record" and elsewhere (see list of references) but they are scattered and incomplete and it therefore seems worth while to bring all the available data together into one paper as a basis for future work on the Manitoba fauna.

During the season of 1931 the writer, accompanied by Mr. T. B. Kurata, spent the period from June 27 to July 20 in Manitoba and enjoyed the privilege of examining the collections of Mr. Norman Criddle at Aweme and Mr. J. B. Wallis at Winnipeg. Since our return to Toronto, Mr. Wallis has generously donated to the Royal Ontario Museum, in which our own collections are placed, a number of desirable specimens, including *Somatochlora ensigera* (2 ♂, 1 ♀). Mr. G. Shirley Brooks, whom we had the good fortune to meet at Victoria Beach, spared no pains to make our visit there as pleasant and profitable as possible. To these gentlemen, without whose aid the present paper would have been very incomplete, the writer has pleasure in expressing his gratitude. He is also indebted to Dr. J. McDunnough, who kindly furnished data on the Manitoba

material in the Canadian National Collection and made this material available for study.

Previous to 1931 the writer made small collections of Odonata in Manitoba on two occasions. The first was in June, 1913, when Winnipeg and Dauphin were visited, and the second in 1921 during a trip by motor-car from Toronto to Banff, Alberta. On this occasion we entered the Province from Minnesota at Emerson, travelled northward to Winnipeg and thence westward into Saskatchewan, making short stops in the vicinity of Portage la Prairie, Virden and one or two other places, but very little was collected.

In 1931 collections were made at the following localities: Victoria Beach, Lake Winnipeg, June 27 to 30; Kildonan Park, on the Red River near Winnipeg, July 1 and 2; The Pas, July 4 to 13; Aweme and vicinity, Stockton and Onah, July 15 to 17; and Selkirk, July 19.

We also collected at Minaki, Ont., which is near the Manitoba boundary line, but the records from this locality are not included in the present list.

The various localities visited on this trip are very different in character and may be briefly described.

At Victoria Beach, which is an attractive summer resort, there is a fine sandy beach backed by sand dunes and low bluffs. It lies within a forested region and the flora, in general, belongs to the Canadian zone, although there is considerable admixture of southern species, including those which are more or less characteristic of the prairies. The tree growth, e.g., consists largely of such typically northern species as white spruce, balsam fir, jack pine, aspen, balsam poplar, and white birch, but there is also plenty of bur-oak, green ash, and Manitoba maple (box elder), and some cottonwood in the sand dune area.

The dragonflies tell the same story. Thus, among the boreal species are *Agrion resolutum, A. angulatum, Aeschna sitchensis, Somatochlora franklini* and *Leucorrhinia hudsonica,* while among the austral forms are *Enallagma civile, Ischnura verticalis, Anax junius, Gomphus fraternus, Libellula pulchella,* and *Pantala hymenea.*

But few species appear to develop in the lake itself. *Gomphus fraternus* was found emerging on the shore; *Sympetrum corruptum* was flying over shallow water near the shore of Victoria Harbour and ovipositing there, as well as in a small lagoon that had been cut off by the receding water, which was unusually low during the season of 1931; and *Enallagma civile* and *E. clausum* appeared most abundantly along the shore and had doubtless emerged from the lake itself. The other species apparently came from smaller bodies of water. Some, like *Somatochlora franklini, S. kennedyi* and *Aeschna sitchensis* are muskeg species and their main breeding places were not found, although extensive bogs were observed from the railway not far from Victoria Beach.

A large bog pond, known locally as the "Hidden Lake" was the breeding place of many species. It occupies a depression close to the broad sandy beach, from which it is separated by a high sandy ridge, and is bounded on the inner side by an open marsh. Dragonflies were abundant here, the species observed being *Lestes unguiculatus, Agrion resolutum, A. angulatum, Nehalennia irene, Enallagma cyathigerum, E. hageni, E. ebrium, E. civile, Anax junius, Aeschna canadensis* (in woods nearby), *Somatochlora franklini, Libellula quadrimaculata,*

L. pulchella, Leucorrhinia intacta, Sympetrum decisum and *S. corruptum*. *Enallagma cyathigerum* was the abundant species of the genus, while *E. civile* was less frequent than on the beach. *Sympetrum corruptum* was common and was ovipositing in pairs.

A few other ponds of an entirely different character were situated upon the beach of Victoria Harbour. They were shallow, with a firm sandy bottom, and somewhat warmed by the sun, but, being fed by a spring-run from the adjacent slope, they were clear and fresh. *Libellula pulchella, Sympetrum corruptum* and *Enallagma civile* were common here and two males of *Ischnura verticalis,* the only specimens seen at Victoria Beach, were also taken. But the most interesting species was *Pantala hymenea,* a small number of which were flying back and forth over the water so swiftly that their capture seemed for some time to be practically impossible. In the end, however, 3 males and 2 females were netted, including an ovipositing pair. This pair flew erratically, dropping suddenly to the water, which the female would strike only once, the pair then swooping to another spot a few yards away, or off to the next pond. The other female captured was ovipositing unaccompanied. The males chased away other dragonflies from their beat, including the vigorous *L. pulchella* as well as other males of their own species. Aeschnas, apparently *A. interrupta lineata,* were also flying over the beach and occasionally visited the ponds, but were not captured. This species was common in the neighbouring woods and also flew over an open marsh in common with *Anax junius.* A few *Leucorrhinia hudsonica* frequented a small pool at the foot of the hill, nearer the source of the spring run, where the water was colder. *Lestes uncatus* and *Sympetrum decisum* were found about small pools in the ditch along the railway.

Of all the species at Victoria Beach *Sympetrum corruptum* was the most generally distributed. It was seen everywhere along the beaches, roads and even the railway track.

Kildonan Park, which we next visited, is a fine large park on the Red River, a few miles below Winnipeg. The banks of the river are wooded and the bottom soft and muddy, but, as the water level was very low, owing to a prolonged drought, it was possible in many places to obtain a fairly secure footing close to the water's edge, just beyond which there were many patches of low, emergent vegetation. There were few of the larger dragonflies here but many damselflies. Of the former *S. corruptum* was still fairly common while *Libellula pulchella* and *Anax junius* were occasionally seen. The damselflies included *Enallagma boreale, E. cyathigerum, E. hageni, E. ebrium, E. civile* (all common), *Agrion angulatum, Ischnura verticalis* and *I. damula.* The capture of several specimens of *I. damula* was a matter of great satisfaction, as we had failed to find it at Victoria Beach, where it had been taken by Mr. Wallis. On the other side of the river, where the banks are high and steep, I took a few more *damula* as well as a male of *Gomphus cornutus,* a species hitherto unknown from Manitoba. *Agrion resolutum* was not seen along the river shore but occurred about two small shady tributaries. *Lestes uncatus* was also taken in a small cattail marsh on one of these streams.

Selkirk, which is also on the Red River, offers conditions similar to those at Kildonan Park. We crossed by ferry to a large wooded island and followed

the muddy beach for about half a mile, besides exploring the woods and clearings in the interior. The island looked favourable for general collecting but the dragon fly season was already waning and nothing was seen except the commoner species noted at Kildonan Park. *Enallagma ebrium* and *E. hageni* were the most abundant species, while *E. civile, E. cyathigerum* and *Ischnura verticalis* were present in smaller numbers. *Sympetrum corruptum* was also still fairly common.

In the vicinity of Aweme, where we enjoyed the hospitality of Mr. Norman Criddle, dragonflies were collected at four principal stations as follows:—

(1) An ox-bow lake in the Assiniboine Valley near Stockton. This is a small lake or large pond, formerly a bend in the river but now entirely isolated and stagnant. It has a soft muddy shore, thickly covered with typical marsh vegetation, and is a characteristic habitat for the pond dragonflies of the district, *e. g., Lestes disjunctus, Enallagma boreale, E. cyathigerum, E. ebrium, Libellula pulchella, Sympetrum decisum, S. corruptum, S. costiferum, S. danae, Leucorrhinia intacta, Aeschna i. lineata* and *Anax junius.*

(2) A bog-margined lake near Onah, occupying a depression among rolling sandy hills. It is much larger than the lake at Stockton and the water is deeper and cooler. *Enallagmas* were common and all the Manitoba species were found except *E. civile,* although of *E. clausum* only one individual was taken. *Aeschna eremita,* not observed elsewhere in southern Manitoba, was taken while patrolling the lake margin, and a few exuviae of *Tetragoneuria* were found, though their season of flight was well over. Other species taken here were: *Libellula quadrimaculata, L. pulchella* (frequent along the shore), *Sympetrum corruptum* (several pairs in cop.) and *Leucorrhinia proxima* (1 ♂).

(3) The Assiniboine River, about five miles north-west of Aweme. There is a fairly strong current here, with some stretches of riffles and in general, the river looked like a good locality for gomphines, although the only species taken by us was *Ophiogomphus rupinsulensis,* two males of which were captured on a hillside nearby. Several other gomphines, however, have been taken in the vicinity of Aweme by Mr. Criddle, viz,. *Gomphus fraternus, G. externus, G. graslinellus* and *Stylurus notatus,* and all of these doubtless develop in the Assiniboine River.

Enallagmas were abundant along the shore in shelter of the high banks. They were all of the common species, *cyathigerum, hageni* and *ebrium.*

(4) Wardle's Creek, a small tributary of the Assiniboine, which arises in a tamarack swamp and flows with considerable current in some parts of its course. It has been dammed by beavers in various places and the pools are of considerable depth, with a very soft bottom. The water was clear and rather cold and, towards the mouth where the stream flows through a tangle of shrubbery and low woods, it appeared to be a typical habitat for Somatochloras of stream habit. None were seen by us but both *S. minor* and *S. ensigera* have been taken near a stream at Onah by Messrs. Criddle and Wallis. Even farther up, where Wardle's Creek flowed through an open sedgy area, only a few dragonflies appeared, a single *Agrion angulatum,* and a few stray Enallagmas and Aeschnas. In the marsh at the source, however, dragonflies were more numerous, *Agrion resolutum* and *Enallagma* spp. being common, while *Aeschna interrupta lineata* and *Libellula quadrimaculata* were not infrequent. *Sympetrum*

decisum flew over small pools formed by the overflow of the creek in certain boggy places.

The Pas, which we visited before going to Aweme, is a small town on the Saskatchewan River at about the latitude of the northern extremity of Lake Winnipeg. It lies well within the Canadian Zone and well beyond the prairie country, although there are large areas of marsh which have a prairie-like appearance. In these marshlands are numerous shallow lakes and ponds, otherwise the country is for the most part densely wooded. The lakes in the immediate vicinity of the town are for the most part surrounded by a tall fringe of reeds (*Phragmites phragmites*) and support an abundant aquatic vegetation. Waterfowl breed around them in large numbers. Bordering the marshes are dense thickets of glaucous willow, which grows much larger than in Ontario. The forests are chiefly black spruce swamps but, on the better drained areas, such as the town site and the slopes of the river, white spruce and aspen are the principal trees, with paper birch and balsam fir in smaller quantities. Groves of large balsam poplar also occur along the river where the banks are low.

The dragonfly fauna is wholly boreal, except for the presence of *Sympetrum corruptum,* which was occasionally seen on roads or along the railway. It is possibly not a permanent resident of this northern region but, being a great wanderer and a very abundant and dominant species in Southern Manitoba, it was not altogether surprising to find it in small numbers so far north. It may be also mentioned in this connection that this species occurs at Banff, Alta., where the general fauna is likewise of boreal type.

The lakes and ponds looked like ideal breeding places for dragonflies, yet, with the exception of a few species of Zygoptera, they appeared to be nearly devoid of odonate life at the time of our visit. *Agrion angulatum* was the most abundant species, followed by *A. resolutum, Enallagma cyathigerum, E. ebrium* and *Nehalennia irene.* In one of the lakes *E. hageni* was also common. *Leucorrhinia borealis* also breeds here without doubt but its season was apparently nearly over. We secured a fair series of females but only six males and most of these were taken along a road leading outside the town, parallel with the large marsh which borders it on the west side. A drainage ditch through a part of the marsh which was used as a pasture was a little more productive, *Lestes uncatus* and *Sympetrum decisum* occurring here in addition to the other species mentioned. *Aeschna i. lineata* and *Somatochlora franklini* occasionally appeared as wanderers, but in the woods along the Saskatchewan on the other side of the town both of these species, as well as *A. eremita,* were at times abundant. In fact, on one occasion the Aeshnas appeared in enormous numbers. They certainly did not come from the river and their large numbers suggested that they had emerged from the lakes. The only species breeding in the river, so far as we could determine was *Stylurus notatus,* which was emerging during our visit.

Another type of habitat in this region consisted in the drainage ditches along the railway in the black spruce and tamarack bogs on the north side of the river. On one side of the railway the ditch was newly dug, free of vegetation, and had a rapid current. The only dragonflies here were *Aeschna i. lineata* and *A. eremita,* which patrolled the stream to some extent, though only incidentally. On the other side there was a small shallow stream, flowing quietly

through the bog vegetation and expanding here and there into small ponds. *Somatochlora minor* flew along this ditch and, about the ponds, *Leucorrhinia hudsonica* and *Agrion resolutum* were common. A short unused siding at right angles to the railway, through a very wet part of the swamp, was bordered by a deeper ditch in which the water had no perceptible current except at its outlet on the railway cutting. This was an ideal place for boreal dragonflies. *Agrion resolutum, A. interrogatum, Nehalennia irene, Aeschna juncea, A. subarctica, Somatochlora franklini, Leucorrhinia hudsonica* and *Sympetrum danae* were the species taken here and a single large *Somatochlora,* either *williamsoni* or *elongata* was observed once, flying along the ditch. The other Aeschnas sometimes wandered over the bog but were evidently incidental. *Agrion resolutum* and *Leucorrhinia hudsonica* were the two most abundant species.

Considering the odonate fauna of Manitoba as a whole, its most remarkable characteristic is perhaps the paucity of strictly nearctic genera. Only three, *Amphiagrion, Tetragoneuria* and *Stylurus,* can be included in this category. *Amphiagrion* has been taken only once and is evidently rare, probably reaching its extreme northern limit in southern Manitoba. *Tetragoneuria* is only artificially separated from the palaearctic *Epitheca,* while *Stylurus* has only recently been separated by Williamson from the holarctic genus *Gomphus,* of which it has hitherto been regarded as a subgenus.

Of the remaining genera, *Pantala* is circumtropical, reaching its extreme northern limit in southern Manitoba, while all the other genera are holarctic. Among these *Agrion* (=*Coenagrion*) is a palaearctic genus with only three North American species, all of which are found in Manitoba. All three have boreal palaearctic representatives, *A resolutum* being represented by *A. hastulatum, A. interrogatum* by *A. concinnum,* and *A. angulatum* by *A. lunulatum,* from which it is barely distinct. Manitoba is also the nearctic zoocentre for the genus *Leucorrhinia.* Of the six North American species, *L. glacialis* is the only one not recorded from Manitoba but it doubtless occurs there, since it is transcontinental and boreal in distribution. Manitoba is the only province in which the ranges of *L. borealis* and *L. frigida* overlap.

The following species are holarctic: *Lestes uncatus* (identical with the European *L. dryas*), *Enallagma cyathigerum,' Aeschna juncea, A. subarctica, Libellula quadrimaculata,* and *Sympetrum danae.* Another holarctic species, *Aeschna coerulea,* is certain to be found in the far north. There are also several species besides the Agrions with very close palaearctic relatives, e.g., *Cordulia shurtleffi* (*C. aenea*), *Somatochlora kennedyi* (*S. arctica*), *Leucorrhinia hudsonica* (*L. dubia*), and *L. borealis* (*L. rubicunda*).

Besides the species listed below *Hagenias brevistylus* and *Gomphus spicatus* may be safely considered as members of the Manitoba fauna, since they have been taken within a few miles of the boundary line, in Ontario. *G. spicatus* was taken by Mr. W. N. Denike at Ingolf, Ont., on Long Pine Lake within one mile of the boundary line. In fact the western end of the lake is in Manitoba.

In the following list the abbreviations C, Ws and Wk refer to the following collectors respectively, Norman Criddle, J. B. Wallis and E. M. Walker. Records marked with an asterisk are represented by specimens in the National Collection, Ottawa.

1. *Calopteryx*[1] *maculata* (Beauv.) Waugh (Ent. Rec. '24).

This is the northwestern limit of the range of this species, which is apparently rare in Manitoba.

2. *Calopteryx*[1] *aequabilis hudsonica* (Say). Winnipeg (Ent. Rec. '24). New records: Aweme. 22.V*, 30.VII (C); Treesbank 19.VI* (T. Criddle); Sandilands, Dawson Road, 11, 12.VII* (C).

3. *Lestes congener* Hagen. Aweme, Westbourne (Walker, '12a). New records: Treesbank, 14, 19.VI, 5.VII*.

The dates range from June 14 to Sept. 20, but the June records should be confirmed as *L. congener* is a late summer and autumn species.

4. *Lestes unguiculatus* Hagen. Aweme, Westbourne, Winnipeg (Walker, '12a). New records: Onah, 21.VII*; Stony Mt., 9.VIII, 10.IX (Ws).

Specimens from Aweme are dated from June 19 to October 7th., a period which approximately covers the seasonal range of the species.

5. *Lestes uncatus* Kirby. Aweme, Westbourne, Winnipeg (Walker, '12). New records: Near Kildonan Park, 1.VII (Wk); Victoria Beach, 29.VI (Wk); 10 miles west of Portage la Prairie, 22.VI (Wk); The Pas, 7-13.VII (Wk).

The dates range from June 22 (Portage la Prairie) to Aug. 30 (Westbourne).

6. *Lestes disjunctus* Selys. Aweme, Westbourne, Winnipeg (Walker, '12a); The Pas, Hudson Bay Railway at mile 214 (Ent. Rec. '18). New records: Stockton, 15.VII (Wk); Victoria Beach, 28.VI, tenerals (Wk); The Pas, 12.VII (Wk).

The dates for this species range from July 4 (Winnipeg) to Aug. 29 (Westbourne). It was just beginning to appear at The Pas during the second week of July, 1931, while *L. uncatus* was quite mature at the same time.

7. *Amphiagrion saucium* (Burm.). Aweme (Walker, '12a; Ent. Rec.. '12).

The single female recorded is still the only specimen known from the territory between Ontario and Banff, Alta. It belongs to the typical eastern race.

8. *Agrion resolutum* Hagen. Winnipeg, Winnipeg Beach (Walker, '12a); The Pas; miles 214 and 332, Hudson Bay Ry. (Ent. Rec. '18). New records: Aweme, 11.VI (C), 6.VII (Ws); Wardle's Creek, near Aweme, 17.VII (Wk); Husavick, 12.VII (Ws); Kildonan Park, 1, 2.VII (Wk); Victoria Beach, 27-30.VI (Wk); near Portage la Prairie, 22.VI (Wk); 7 mls. east of Virden, 23.VI (Wk); Dauphin 22, 23.VI (Wk); L. Winnipegosis, 13.VII (Ws); The Pas, 4-13.VII (Wk); mile 256, Hudson Bay Ry. 12.VII (Ws).

Dates range from June 7 (Winnipeg) to July 27 (The Pas) but it doubtless flies later at the latitude of The Pas.

Common about shady streams and bogs in southern Manitoba; more abundant and generally distributed in the north, where it frequents open marshes as well as bogs. It is, however, essentially a bog or moorland species.

9. *Agrion interrogatum* Selys. Miles 214 and 332, Hudson Bay Ry. (Ent. Rec. '18). New records: The Pas, 10.VII (Wk), not uncommon at a

[1] I have returned to the use of *Calopteryx* for these species, instead of *Agrion*, since the change to the latter name has never been approved by the majority of the leading odonatists, particularly those of Europe.

ditch beside an old railway siding in a bog, seen mostly in pairs.

This is strictly a bog or muskeg species, being much more local than *A. resolutum.*

10. *Agrion angulatum* (Walk.) Aweme, Winnipeg Beach (Walker, '12a; Ent. Rec. '13); The Pas (Ent. Rec. '18). New records: Aweme, 30.V (C); Wardle's Creek, near Aweme, 17.VII (Wk); Winnipeg, 24.VI (Ws); Kildonan Park, 1, 2.VII (Wk); Victoria Beach, 27-30.VI (Wk); near Portage la Prairie, 22.VI (Wk); 7 mls. east of Virden, 23.VI (Wk); Dauphin, 22, 23.VI (Wk); The Pas, 4-13.VII (Wk.)

Abundant about sloughs, shallow lakes and slow streams. It was the commonest damselfly about the shallow, soft-bottomed lakes at The Pas in July, 1931. It did not appear in the muskeg where the other two Agrions occurred.

The date range from May 30 to July 17 (both in the vicinity of Aweme). The adult season is, however, undoubtedly later in the north.

11. *Nehalennia irene* (Hagen). Aweme, Westbourne, Winnipeg, Winnipeg Beach (Walker, '12a); Dauphin (Ent. Rec. '14). New records: Onah, 9.VII (Ws), 16.VII (Wk); Victoria Beach, 30.VI (Wk); The Pas, 4-13.VII (Wk).

Common and generally distributed but less abundant than in the eastern provinces. June 19 (Winnipeg Beach) to July 29 (Westbourne).

12. *Ischnura verticalis* (Say). Winnipeg, 3.VII (Ws); Kildonan Park, 1, 2.VII (Wk); Selkirk, 19.VII (Wk); Victoria Beach, 30.VI (Wk).

Not very common at this season, probably more so in the spring and autumn. At Victoria Beach it was found only at one of the shallow beach ponds, only two males having been taken. It has not been previously reported from Canada, west of Ontario.

13. *Ischnura damula* Calvert. Aweme (Ws); Kildonan Park, 1, 2.VII (Wk); Victoria Beach, 19.VII (Ws)*.

One of our main objects in visiting Victoria Beach was to find this species. We failed in this but obtained it immediately afterwards at Kildonan Park. It was not at all common and only a small series was secured. Most of these were taken about a small patch of Sagittaria growing in the water close to a steep bank on the south side of the river. It is quite probably commoner earlier and later in the season. Not previously reported from Canada.

14. *Enallagma clausum* Morse. Dauphin Lake (Ent. Rec., '18). New records: Husavick, 11.VII (Ws)*; Onah, 16.VII (Wk); Victoria Beach, 27-30.VII (Wk).

Abundant at Victoria Beach on the beach and in the shelter of low vegetation along the nearest banks and sand dunes; associated with *E. civile.* Only a single male was taken at Onah.

Manitoba specimens are large, like those from Lake Nipissing, Ont. Those from Victoria Beach measure as follows: length, ♂ 34-37 mm. ♀ 33.5-36 mm.; hind wing, ♂ 19-22 mm., ♀ 20.5-22 mm.

15. *Enallagma boreale* Selys. Aweme, Winnipeg Beach (Walker, '12a). New records: Stockton, 15.VII (Wk); Onah, 16.VII, common (Wk); Assiniboine River, near Aweme, 17.VII (Wk); Kildonan Park, 1, 2.VII (Wk); The Pas, 4.VII (Wk); Strathclair, 16.VII, abundant (Ws).

This species, so generally distributed in the north, was evidently rare at The Pas, only one specimen, a male, having been taken among the myriads of *E. cyathigerum*.

The dates range from June 19 (Winnipeg Beach) to July 17 (near Aweme).

16. *Enallagma cyathigerum* (Charp.) The Pas (Ent. Rec., '18). New records: Stockton, 15.VII (Wk); Onah, 16.VII, common (Wk); Assiniboine River, near Aweme, 17.VII, abundant (Wk); Kildonan Park, 1, 2.VII, common (Wk); Selkirk, 19.VII, rather scarce (Wk); Victoria Beach 28-30.VI, common (Wk); near Lepelletier, 17.VI (Wk); 7 mls. east of Virden, 23.VI; The Pas, 1-29.VII (Ws, Wk); mile 214 Hudson Bay Ry., 7-24.VII (Ws); Strathclair, 16.VII (Ws).

A very abundant species in Manitoba, dominant in the north. Large numbers occurred at The Pas in the open woods and clearings bordering the marshes. They had evidently come from the neighbouring lakes and ponds but had been carried by strong winds to the shelter of the trees in the adjacent higher land. This was by far the most abundant Enallagma at The Pas and is here of larger size than in southern Manitoba.

17. *Enallagma hageni* (Walsh). Westbourne, Winnipeg (Walker, '12a); Dauphin (Ent. Rec., '14); The Pas (Ent. Rec., '18). New records: Stockton, 15.VII (Wk); Onah, 16.VII, common (Wk); Assiniboine River near Aweme, 17.VII (Wk); Kildonan Park, 1, 2.VII, abundant (Wk); Selkirk, 19.VII abundant (Wk); Victoria Beach, 27-30.VI (Wk); 7 mls. east of Virden, 23.VI (Wk); Dauphin, 23.VI (Wk); The Pas, 13.VII (Wk); Fork River, 14.VII; (Ws); Winnipegosis, 13.VII (Ws).

Abundant in southern Manitoba, more local northward. At The Pas it was found at only one of the lakes, several of which were visited. Here it was common in the open marsh bordering the lake. June 23 (Virden) to July 27 (Westbourne). It doubtless flies well into August as it does in Ontario.

18. *Enallagma ebrium* (Hagen). Westbourne, Winnipeg (Walker, '12a): Dauphin (Ent. Rec., '14); Virden (Ent. Rec., '22); The Pas (Ent. Rec., 18). New records: Husavick, 11.VII (Ws); Stockton, 15.VII (Wk): Onah 16.VII, common (Wk); Assiniboine River near Aweme, 17.VII (Wk); Kildonan Park, 1, 2.VII abundant (Wk); Selkirk, 19.VII, abundant; Victoria Beach, 27-30.VI (Wk); The Pas, 4-13.VII (Wk); Fork River, 14.VII (Ws); Winnipegosis, 13.VII (Ws).

Abundant in southern Manitoba and evidently common as far north as The Pas. Most of the specimens we saw at The Pas were net yet quite mature in coloration. They were of the usual size while those from the bog lake at Onah were smaller.

E. ebrium and *hageni* both emerge later than *borcale* and *cyathigerum*. The dates for *ebrium* range from June 23 (Virden) to July 29 (The Pas), but their season is certainly longer than this.

19. *Enallagma civile* (Hagen). Winnipeg (Walker, '12a); Lepelletier (Ent. Rec., '22). New records: Kildonan Park, 1.VII, frequent (Wk); Selkirk, 19.VII, scarce (Wk); Victoria Beach, 27-30.VI, very abundant (Wk). The most abundant damselfly at Victoria Beach. Except for stray indi-

viduals it was confined to the lake shore, on the beaches and in the low vegetation in the shelter of banks and sand dunes nearby.

20. *Aeschna sitchensis* Hagen. Winnipeg, Winnipeg Beach, Westbourne (Walker, '12a, '12b). New records: Aweme, 6.VII (C); Husavick, 30.VI to 23.VIII (C); Victoria Beach, 19-25.VI (Ws)*, 27-29.VI (Wk); Hudson Bay Ry. as far as Mile 214 (Ws, in litt.).

Mr. Wallis tells me this species is common at Victoria Beach. It is a bog species of northern range and should be most abundant north of The Pas. I saw a single specimen there but failed to capture it.

A. sitchensis appears earlier than most Aeschnas. The dates range from June 20 (Victoria Beach) to Sept. 6 (Winnipeg, Winnipeg Beach).

The nearly related *A. coerulea septentrionalis* is certain to occur in far northern Manitoba but has not yet been reported.

21. *Aeschna juncea* L. The Pas, 4-9.VII (Wk).

One exuvia from a drainage ditch in a marsh, near one of the lakes. Several other exuviae and two male adults were also taken at the ditch along the railway siding in the spruce and tamarack swamp. Other adults were seen in flight but could not be captured. Most had apparently dispersed and not yet returned to their breeding place.

22. *Aeschna subarctica* Wlk. Winnipeg (Walker, '12a, '12b). New records: The Pas, 7-11.VII.

This species was just beginning to emerge and I was fortunate in finding a male with its exuvia. Two other exuviae were found in nearly the same spot, these being easily recognizable, though very similar to *juncea*. They were found among the sedges growing in the ditch along the railway siding, where *A. juncea*, *Agrion interrogatum*, etc., occurred.

The description of the nymph is withheld for a future paper.

23. *Aeschna cremita* Scudd. Husavick (Walker, '12b). New records: Aweme, 30.VII (C); Onah, 16.VII (Wk); The Pas, 9-13.VII (Wk); Mile ? 214, Hudson Bay Ry., 25.VII (Ws).

Common at The Pas, especially along the Saskatchewan River south of the town. On July 13, the weather being bright and cool, many individuals were seen along the river beach, basking on logs in the sun, a somewhat unusual habit for the genus. During the warmer days preceding this occasion they were in almost constant flight.

At Onah a single male was taken while patrolling the edge of the muskeg lake. One or two others were seen.

24. *Aeschna interrupta lineata* Wlk. Aweme, Westbourne, Winnipeg, Winnipeg Beach, Swan River (Walker, '12a, '12b). New records: Stockton, 15.VII (Wk); Wardle's Creek, near Aweme, 17.VII (Wk); Husavick, 5.VII, 17.25.VIII* (C); Victoria Beach 24-30.VI (Wk); The Pas, 7-13.VII (Wk).

A very abundant species, far outnumbering all the other species of Aeschna. It was just beginning to be common at Victoria Beach in a certain patch of woods during the last week of July. In clearings along the Saskatchewan and over the beach and road hundreds were in flight on July 9, and many flew up and down a freshly dug ditch containing running water along the railway in a spruce-tam-

arack swamp. The breeding places in the vicinity of The Pas are doubtless neither the river nor the bog ditches but the numerous marsh-bordered ponds and lakes. They were common but not particularly abundant at the ox-bow lake near Stockton.

25. *Aeschna canadensis* Wlk. Westbourne (Walker, '12a, '12b). New records: Aweme, 19.VII* (C); Husavick, 2.VII (C), 17.VIII*; Winnipeg, 27.IX (Ws); Victoria Beach, 28.VI (Wk); Township of Range, 11 E. (Ws).

We met with this species only at Victoria Beach, where it was common along a road through the woods in the vicinity of the "Hidden Lake." This is several miles from the wood where *lineata* was found. *A. canadensis* probably does not occur as far north as The Pas.

26. *Aeschna umbrosa* Wlk. Treesbank, Hilton, Winnipeg Beach (Walker, '12a, '12b).

The dates range from July 28 (Hilton) to Sept. 6 (Winnipeg Beach). Probably commoner than the few records indicate.

27. *Aeschna constricta* Say. Westbourne, Winnipeg Beach (Walker, '12a, '12b). New record: Aweme, 4, 26.VIII*; Magnus, 2.IX (Ws).

28. *Anax junius* Drury. Aweme (Walker, '12a). New records: Stockton, 15.VII (Wk); Kildonan Park, 1.VII (Wk); Victoria Beach, 27-30.VII (Wk); Husavick, 8.VIII (Ws).

We captured no specimens but observed it frequently, especially at Victoria Beach, where it flew over an open marsh. It is easily recognized in flight.

29. *Ophiogomphus rupinsulensis* (Walsh). Aweme (Walker, '12a); Griswold and Virden (Ent. Rec. '22). New record: Assiniboine River, near Aweme, 17.VII (Wk).

The dates range from June 23 to July 19.

30. *Ophiogomphus colubrinus* Selys. Mile 332, Hudson Bay Ry., 20.VII, 1 ♂, 1 ♀, tenerals. (Ent. Rec., '18).

This is the western limit of this species, so far as known. It is the most northerly of American gomphines.

31. *Gomphus cornutus* Tough. Red River near Kildonan Park, 2.VII, 1 ♂ (Wk).

We have also taken this species at Minaki, Ont., which is not far from the Manitoba border.

32. *Gomphus graslinellus* Walsh. Aweme, 6.VI 1922 (C), 1 ♀.

We also found it at Minaki, Ont., where a number of specimens had already been taken by Dr. McDunnough.

33. *Gomphus externus* Hagen. Aweme, (Walker, '12a). Winnipeg (Ent. Rec., '12; Walker, '12a). New record: Red River, near Winnipeg, 21.VI, 1 ♀ (Wk).

This specimen was taken in 1913, near the present site of Kildonan Park. A few exuviae were found at the same place and belong either to this species or the small variety of *fraternus*.

34. *Gomphus fraternus* Say. Aweme, 7, 25.VI*, 13, 14.VII*, 1-9.VII (C); Winnipeg, 25.VI (Ws); Victoria Beach, 28, 29.VI (Wk), 8-9.VII*.

The specimens from Victoria Beach are typical while those from Winnipeg and Aweme are small with the dark markings a light brown, instead of black.

They appear to constitute a distinct race but I am unable to find any structural differences from the typical form.

At Victoria Beach this species was just beginning to be common. Some were newly emerged, while others had attained their full colours. Most of those observed were flying about the sand dunes near the beach.

35. *Stylurus notatus* (Rambur). Aweme (Walker, '12a). New record: Aweme, 16 E, 17.VII (Ws); The Pas, 9, 10.VII (Wk).

But few adults were taken at The Pas and these were tenerals but numerous exuviae were found on the sandy beach of the Saskatchewan south of the town.

36. *Cordulia shurtleffi* Scudd. Aweme, 3-14.VI (C); Onah, 8.VII (Ws); Douglas Lake, 15.VI*; The Pas, 1.VII (Ws), 9, 10.VII (Wk); Mile 17, Hudson Bay Ry., 2.VII (Ws).

A female of this species from Aweme was carelessly recorded by the writer (12a) as *Somatochlora albicincta.*

37. *Somatochlora walshii* (Scudd). Dauphin, 23.VI (Walker, '12a, '25; Ent. Rec. '14).

38. *Somatochlora minor* Calv. Aweme; mile 256, Hudson Bay Ry., (Ent. Rec., '18; Walker '25). New Records: Onah, 8, 18.VII (Ws); The Pas, 10.VII (Wk).

At The Pas *S. minor* flew up and down the ditches dug along the railway in the spruce swamp. There was a gentle current in the ditch, so that the habitat was quite typical for this species.

39. *Somatochlora williamsoni* Wlk. Winnipeg Beach, 19.VI '09 (Ws).

Mr. Wallis has also taken this species in Ontario, close to the Manitoba boundary line. The above is its western limit as yet recorded.

40. *Somatochlora ensigera* Martin. Onah, 17, 18.VI, 21, 2 ♂ (Ws); Westbourne 10.VII 26, 1 ♀ (Ws).

I have seen several specimens of this species collected by Mr. Wallis, who wrote me that they were "flying up over the high southern bank of tamarack swamp" (quoted from label). I visited this spot in 1931 but saw only *S. franklini.*

This is the first Canadian record for this species.

41. *Somatochlora franklini* Selys. Winnipeg, Winnipeg Beach, Husavick (Walker, '12, and Ent. Rec., '12 as *S. macrotona* Wmsn.; Walker, '25); The Pas; miles 214, 256 and 332, Hudson Bay Ry. (Ent. Rec., '18; Walker, '25). New records: Onah, 8.VII (Ws); Assiniboine River, near Aweme, 17.VII, seen (Wk); Sandilands, Dawson Road, 25.VI*, 11, 12.VII*; Waugh, 2.VIII (Ws); Victoria Beach, 19.VII, 27-30.VI (Wk); The Pas, 7-13.VII (Wk); Township of Range, 11 E, VI (Ws).

Very abundant at both Victoria Beach and The Pas in 1931. The individuals at Victoria Beach were chiefly teneral females. They were first observed on June 27 about sundown, flying high among the tree tops, but, on the following day, about 8 a. m., they were flying low over a lawn, shaded by spruce trees, and were easily captured. Later in the forenoon a large number were observed flying back and forth in the shelter of a low cliff facing the beach. They were nearly all females and could be easily captured from the top of the cliff. The weather was exceedingly warm, as it was during our entire stay at Victoria

Beach. Other individuals were seen from time to time along the wood roads and about the "Hidden Lake."

The females of *S. franklini* are dimorphic, one form resembling the male much more closely than the other. Like the male, though not quite to the same extent, it has disproportionately short wings and a long abdomen, constricted at segment 3. It also has vestigial genital lobes. In the other type of female the abdomen is much shorter than in the male, the wings are actually as well as relatively longer, segment 3 is scarcely constricted, being in the teneral phase depressed, and there are no traces of genital lobes. It was the discovery of the homoeomorphic female which led Williamson to describe *S. macrotona,* but there is no doubt that only one species is involved in these forms.

42. *Somatochlora kennedyi* Wlk. Dauphin (Walker, '25). New record: Victoria Beach, 28.VI (Wk); 1 ♀ captured among a number of *S. franklini* by Mr. Kurata.

In the eastern provinces this species is much commoner than *S. franklini,* whereas in Manitoba the reverse is the case.

43. *Somatochlora forcipata* (Scudd.). The Pas, 10.VII (Wk).

A single male was taken in a narrow forest road skirting the Saskatchewan south of the town.

This is the first definite record for this species from the territory between Ontario and the Rocky Mountains.

44. *Somatochlora whitehousei* Wlk. Mile 332, Hudson Bay Ry. (Ent. Rec., '18 as *S. septentrioalis;* Walker, '25).

45. *Somatochlora cingulata* Selys. Miles 256 and 332, Hudson Bay Ry. (Ent. Rec., '18; Walker, '25).

The Manitoba specimens are of maximum size for this large species.

46. *Williamsonia fletcheri* Wmsn. Lake Winnipeg (Hagen, '90a).

Originally recorded as *Cordulia lintneri.* It is a muskeg species and is probably much more generally distributed than our present knowledge indicates.

47. *Tetragoneuria spinigera* (Say). Winnipeg, Aweme (Walker, '12a). New records: Onah, 20.VI*; 8.VII (Ws); 16.VII, exuviae found along the edge of the bog-margined lake (Wk).

48. *Libellula quadrimaculata* L. Aweme*, Winnipeg (Walker, '12a). New records: Wardle's Creek, near Aweme, 17.VII; Onah, 16.VII (Wk); Stony Mountain, 5.VI*; Victoria Beach, 28-30.VII (Wk); The Pas, 10.VII. Abundant about sloughs and marshy lakes.

49. *Libellula pulchella* Drury. Aweme, Husavick (Ent. Rec., '12; Walker, '12a). New records: Stockton, 15.VII (Wk); Onah, 16.VII, common (Wk); Selkirk, 19.VII (Wk); Winnipeg Beach, 3.VII*; Victoria Beach, 28-30 (Wk).

At Victoria Beach it was most common about the shallow lagoons on the harbour beach, where *Pantala hymenea* occurred.

50. *Libellula exusta julia* (Say) Uhler. Cowan, 16.VI (C); Victoria Beach (Brooks and Ws).

51. *Sympetrum corruptum* (Hagen). Aweme, Winnipeg (Walker, '12a). New records: Aweme, 7.VI to 8.IX (C); Stockton, 15.VII (G. S. Brooks); Onah, 16.VII, several pairs in cop. (Wk); Kildonan Park, 1,

2.VII (Wk); Victoria Beach, 27-30.VI (Wk); The Pas, 4-9.VII (Wk).

This is one of the commonest dragonflies in Manitoba. It was very abundant at Victoria Beach, where the specimens were all old and mature, although it was only the end of June. At The Pas it was seen only occasionally and was perhaps merely a straggler (v. p. 61). Its season of adult life is remarkably long, specimens from Aweme being dated from June 7 to Sept. 8. On this last date Mr. Criddle took a pair in copula, while we observed ovipositing females at Victoria Beach on our arrival on June 27. It is possible, therefore, that there are two generations a year.

52. *Sympetrum madidum* (Hagen). Seven miles west of Portage la Prairie, 27.VI (Ent. Rec., '22). New record: Cormorant Lake, 8.VII*; Aweme E, 16 E, 9.VII (Ws).

Seven males and five females were taken near Portage la Prairie, on a prairie road, all in fresh condition. It has not been taken in Canada east of Manitoba.

53. *Sympetrum decisum* (Hagen). Aweme, Treesbank, Westbourne, Winnipeg, Deloraine*, Grandview (Walker, '12a). New records: Wardle's Creek, near Aweme, 17.VII (Wk); Stockton, 15.VII, tenerals and adults (Brooks and Wk); Onah, 8.VII (Ws); The Pas, 4-8.VII (Wk).

This species has a long adult season, the dates ranging from June 22 (Portage la Prairie) to Sept. 18 (Grandview).

54. *Sympetrum obtrusum* (Hagen). Westbourne, Swan River (Walker, '12a).

This species, which is by far the most abundant Sympetrum in Ontario, is apparently rather local in Manitoba and westward.

55. *Sympetrum costiferum* (Hagen). Aweme, Westbourne, Winnipeg, Carberry (Walker, '12a). Aweme, 4.VIII to 1.IX (C), 14.X*; Stockton, 15.VII, teneral (Brooks); Onah, 19.VIII.

A late species, the dates ranging from July 15, when a single teneral was found at Stockton, to Oct. 14.

56. *Sympetrum danae* (Sulz.). Aweme, Westbourne, Winnipeg, Grandview (Walker, '12a). New records: Stockton, 15.VII (Wk); The Pas, 10.VII (Wk).

At The Pas young individuals were beginning to appear in the bog along the railway siding, where *Agrion interrogatum* etc. occurred. At Stockton, also, only tenerals were seen. In this district (Aweme) specimens have been taken as late as Sept. 26.

57. *Leucorrhinia hudsonica* (Selys). Lake Winnipeg (Hagen '90b); Winnipeg, Winnipeg Beach* (Walker, '12a); near Portage la Prairie, (Ent. Rec., '22). New records: Victoria Beach, 28-30.VI (Wk); Sandilands, Dawson Road, 11, 12.VII*; The Pas, 1.VII (Ws), 7-10.VII (Wk); mile 332, Hudson Bay Ry., 18.VII (Ws).

The habits of this species at Victoria Beach and The Pas have already been described (p. 59). It is characteristic of cold bogs or muskegs.

58. *Leucorrhinia borealis* Hagen. Bird's Hill, Aweme (Walker, '12a); Dauphin (Ent. Rec., '14). New record: The Pas, 4-13.VII (Wk).

The conditions under which this species was found at The Pas have already been described (p. 61). Its season appears to be early and brief, nearly

all the dates of specimens from southern Manitoba being in June. One specimen from Aweme, dated July 15, is somewhat teneral.

59. *Leucorrhinia proxima* Calvert. Winnipeg Beach (Walker, '12a). New records: Aweme, 11.VI (C); Onah, 8.VII, abundant tenerals (Ws); 16.VII (Wk); The Pas, 13.VII.

A pair in copula was taken on the river beach at The Pas, and at least one other male seen. A single large male was taken from the bog lake at Onah.

The record of *L. glacialis* ♀ from Aweme (Walker, '12a) probably belongs to *proxima*, although *L. glacialis* doubtless occurs in northern Manitoba.

60. *Leucorrhinia frigida* Hagen. "North Red River, British America" (Hagen, '90b). New record: Teulon, 22.VI, '09, 1 ♂ (A. J. Hunter, coll. Ws). This species was overlooked in my 1912 paper.

61. *Leucorrhinia intacta* Hagen. Aweme, Winnipeg, Winnipeg Beach (Walker, '12a). New records: Victoria Beach, 28.VI (Wk); Stockton, 15.VII (Wk).

Very plentiful at Victoria Beach about the "Hidden Lake" and adjoining marshes and sand dunes. All the individuals were young, some teneral, the females sometimes with flavescent wings. An exuvia was found at the edge of the lake. This species was also frequent at Stockton, where it was fully mature.

62. *Pantala hymenea* (Say). Husavik (Ent. Rec., '12a). New record: Victoria Beach, 30.VI (Wk).

The occurrence and habits of this species as observed at Victoria Beach have already been discussed in the description of this locality. (p. 59).

63. *Pantala flavescens* (Fabr.). Husavick, 6.VIII, 14, 1 ♂ (Ent. Rec., '15). This is the only Canadian record for this species.

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BOOK NOTICE

A preliminary list of the Insects of the Province of Quebec, Part II, Diptera, by A. F. Winn and G. Beaulieu, revised and supplemented by C. E. Petch and J. B. Maltais. Published as a supplement to the 24th report of the Quebec Society for the Protection of Plants, Quebec, 1932.

This list presents detailed distributional records for 1901 species of Diptera known to occur in the province of Quebec. In its preparation the revisers have used as a basis the Winn and Beaulieu list of 780 species published in 1915. The principal collections of Diptera in the province of Quebec have been visited and examined, also the Canadian National Collection at Ottawa.

The classification followed is mainly that of C. H. Curran except in the Tipulidae and allied families which were compiled by Dr. C. P. Alexander and the Culicidae and Simuliidae by C. R. Twinn. The list of Tipulidae is particularly noteworthy, 246 species being recorded. Among the other larger representations are the Chironomidae (68 species), Tabanidae (52 species), Dolichopodidae (181 species), Syrphidae (205 species), Muscidae (258 species), Calliphoridae (49 species) and Tachinidae (175 species).

The species are arranged alphabetically under each genus followed by the locality, month of capture and name of collector. An Index to Families, Genera and Subgenera is provided. There is also a useful list of the Quebec localities giving the county for each and a directory of the collectors and contributors. The list should be of interest to Dipterists generally and of special value to students of the Quebec fauna.—G. S. Walley.

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